

Integration Times

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Let the sky noise coupled into the balun (after mismatch losses) be T_s and the active balun noise level be T_b . Define sky noise dominance to be:

$$D = T_s/T_b$$

The ratio of the total system noise, $T_s + T_b$, to the noise in an ideal system with a noiseless balun is:

$$R = (T_s + T_b)/T_s$$

To obtain the same output fluctuation level in a real system compared with an ideal system one must increase the integration time by a factor of R^2 .

The results are:

D	R	R^2
0 dB	2.0	4.0
1 dB	1.79	3.22
2 dB	1.63	2.66
3 dB	1.5	2.25
6 dB	1.25	1.57
10 dB	1.1	1.21
13 dB	1.05	1.10
16 dB	1.03	1.05
20 dB	1.01	1.02

One sees that for $D = 6$ dB, integration times must be increased by 57%; this seems to me to be practical goal. $D = 10$ dB with a 21% increase is obviously better. Observations are possible with $D = 0$ dB or even $D = -3$ dB for strong sources (like the active Sun) where sensitivity is no problem. Even sensitive observations would be possible in these cases, just very slow.